CAROLINAS CLEAN ENERGY BUSINESS ASSOCIATION

CROSS-EXAMINATION **EXHIBIT**

"6"

BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE APPLICATION OF PUBLIC SERVICE COMPANY OF NEW MEXICO FOR DECERTIFICATION AND ABANDONMENT OF 114MW OF LEASED PALO VERDE NUCLEAR GENERATING STATION CAPACITY AND SALE AND TRANSFER OF RELATED ASSETS AND FOR APPROVAL TO PROCURE NEW RESOURCES UNDER 17.9.551 NMAC	)	**Case No. 21-_____-UT**
PUBLIC SERVICE COMPANY OF NEW MEXICO,	)	
Applicant.	)	

DIRECT TESTIMONY

OF

NICK WINTERMANTEL

April 2, 2021

NMPRC CASE NO. 21-_____-UT
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NICK WINTERMANTEL

WITNESS FOR
PUBLIC SERVICE COMPANY OF NEW MEXICO

DIRECT TESTIMONY
OF NICK WINTERMANTEL
NMPRC CASE NO. 21-____-UT

I. INTRODUCTION AND PURPOSE

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Nick Wintermantel, and my business address is 3000 Riverchase Galleria Suite 575, Hoover, AL, 35224.

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL QUALIFICATIONS.

A. My educational background and relevant employment experience are summarized in PNM Exhibit NW-1 attached to my testimony.

Q. HAVE YOU PREVIOUSLY TESTIFIED IN UTILITY-RELATED PROCEEDINGS?

A. Yes. I presented testimony before the New Mexico Public Regulation Commission ("NMPRC" or "Commission") in PNM's San Juan Replacement Resource Filing in Case No. 19-00195-UT. I have also testified in Georgia, South Carolina, and North Carolina in utility-related proceedings. These proceedings are reflected in PNM Exhibit NW-1.

Q. ARE YOU SPONSORING ANY EXHIBITS WITH YOUR TESTIMONY?

A. Yes. Along with my educational background and relevant employment experience as summarized in PNM Exhibit NW-1, I am sponsoring PNM Exhibit NW-2, which is a copy of Appendix M to PNM's 2020 Integrated Resource Plan ("IRP"): "PNM

Planning Reserve Margin (PRM) and Effective Load Carrying Capability (ELCC) Analysis."

Q. PLEASE PROVIDE AN OVERVIEW OF YOUR EXPERTISE PERFORMING RESOURCE ADEQUACY AND PLANNING STUDIES.

A. Since being employed by Astrapé in 2009, I have managed target reserve margin studies; Effective Load Carrying Capability (ELCC) studies of wind, solar, storage, and demand response resources; resource selection decisions; and ancillary service studies for integrating renewables. I performed these studies using Astrapé's proprietary Strategic Energy Risk Valuation Model (SERVM) used by utilities and system operators across the U.S. and internationally. Prior to working at Astrapé I worked in various resource planning functions with the Southern Company, which included work for its operating companies as well as Southern Power.

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?

A. My testimony discusses PNM's resource adequacy requirements in 2023 after the abandonment of the Palo Verde leases. At a high level, I summarize the ELCC and PRM results of the 2020 IRP which were used in PNM's planning process. I also present the 2023 loss of load expectation (LOLE) of specific portfolios provided by PNM as part of the Palo Verde replacement resources. Finally, I discuss the importance of PNM maintaining reliability as the system and surrounding regions

move away from dispatchable resources and rely more heavily on intermittent renewable and energy limited storage resources.

Q. PROVIDE A BRIEF OVERVIEW OF WHAT YOUR TESTIMONY CONCLUDES.

A. My testimony concludes the new resource portfolio brought forward by PNM resolves the resource adequacy need in 2023 and provides a reliable system as measured by Loss of Load Expectation (LOLE).

II. SYSTEM RESOURCE ADEQUACY MODELING

Q. PLEASE DESCRIBE GENERALLY YOUR ROLE IN THE PNM IRP PROCESS AND HOW THE SERVM MODEL WAS UTILIZED.

A. My team was responsible for the resource adequacy analysis conducted in the 2020 IRP, all of which was performed using the SERVM model. SERVM was used to calculate the ELCC of intermittent renewable resources and energy limited resources, such as storage and demand response, at different capacity penetration levels. The ELCC of a resource determines the reliability contribution of that resource compared to a "perfect" resource that is available in all hours of the year. In general, as the penetration of solar, wind, and storage increases, the marginal

ELCC value of the resource declines as shown in the IRP.[1] SERVM was also used to calculate the PRM required to meet PNM's LOLE standard.

Q. PLEASE DEFINE LOLE AND THE LOLE STANDARD USED BY PNM TO DETERMINE THE PLANNING RESERVE MARGIN.

A. LOLE (Loss of Load Expectation) is a widely accepted metric for determining resource adequacy for electric systems and represents the expected number of days in a year that load will not be met. The metric selected by PNM is 0.2 days per year. In other words, PNM plans to build enough capacity that it would only experience firm load shed events due to capacity shortages two times every 10 years. This standard is less stringent than the 0.1 LOLE standard used by many utilities and ISO/RTOs which is called the one day in 10-year standard. As discussed by PNM Witness Nicholas L. Phillips, PNM plans to shift towards the one day in 10-year standard of 0.1 for future IRPs. The 0.1 LOLE standard would require PNM to procure or build additional capacity above the PVNGS replacement portfolios currently proposed.

Q. HOW DO PRM AND ELCC INTERACT TOGETHER?

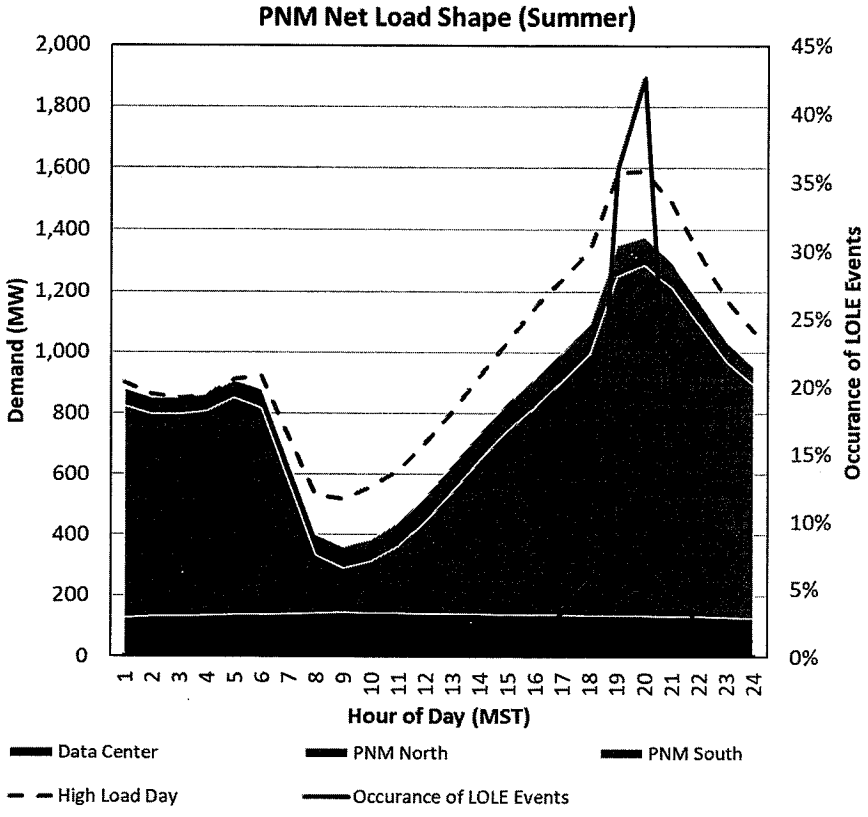
A. In order to calculate the PRM, the capacity contribution of each resource is calculated. PNM has traditionally used the installed capacity (ICAP) of each generating unit to measure the contribution of the resource to meet PRM. As

[1] See PNM 2020 IRP at Section 6.4 and Appendix M (attached to this testimony as PNM Exhibit NW-2)

outlined in PNM's 2020 IRP in Section 4.1 as well as Appendix M (which is attached to this testimony as PNM Exhibit NW-2), PNM is now using Unforced Capacity (UCAP) in its PRM for resource planning. The UCAP of a traditional generating resource is equal to its installed capacity derated by its forced outage rate. For example, a 100 MW generator with a 5% outage rate would have a UCAP of 95 MW. This change, in conjunction with using the ELCC results for intermittent and energy limited resources, treats capacity from all resources equivalently.

Q. THROUGH YOUR ANALYSIS PRESENTED IN PNM EXHIBIT NW-2, HAVE YOU IDENTIFIED THE MOST CRITICAL PERIODS ON PNM'S SYSTEM?

A. Yes. As shown in Figure 12 of NW-2 and below, the highest risk hours in 2023 are seen in the summer late afternoon and evening hours as solar output decreases and the net load (load net of renewable generation) rises. The figure shows the demand on the primary axis and the red line shows the occurrence of LOLE events on the secondary axis.



Q. IS THIS DIFFERENT FROM THE STUDY PERFORMED BY ASTRAPÉ IN THE 2017 IRP?

A. Yes. In the 2017 IRP, approximately 400 MW of solar was on the system in the PRM Study. PNM now has over 1,500 MW of solar projected for 2023. This projected level of solar is a combination of existing resources, the resources approved in the recent San Juan abandonment and replacement resource analysis filed in the San Juan Abandonment and Replacement Resource Case Nos. 19-00195-UT and 20-00182-UT, the proposed 240 MW of solar PV and 100 MW of four-hour battery storage resources requested for approval on behalf of Greater

Kudu in Case No 21-00031-UT, as well as those requested for approval in the instant proceeding. As more solar has been added to the system, the net load peak has shifted from the afternoon hours to later in the day. As discussed in detail by PNM Witness Nicolai Schlag, planning to meet this "net load" is different than the traditional method of planning for the gross peak load. Traditionally, a utility was concerned about a single annual peak or perhaps two seasonal peaks, knowing that if there were sufficient resources for those hours, there were likely sufficient resources for all hours.

Q. PLEASE PROVIDE THE PRM REQUIREMENTS DETERMINED BY PNM'S RECENT 2020 IRP FILED ON JANUARY 29, 2021.

A. Astrapé calculated several PRM requirements based on different external market support assumptions as shown in the table below. Being a smaller utility, the amount of capacity PNM should expect from neighbors during peak periods is a significant driver in the PRM requirement. For PNM to stand on its own without any assistance from neighboring utilities, it would require a 23% reserve margin using the UCAP accounting convention discussed earlier. Since PNM is interconnected to other regions, market support alternatives were simulated to understand the impact on PRM. These results showed a range of PRMs between 10% and 20%. The market assumptions during net load peak hours (summer hours 19-22) on high load days ranged from 200 – 300 MW down to 0-50 MW, as well as an alternative that assumed a 50 MW import constraint in all hours of the year.

PNM determined that the 50 MW import constraint during net load peak hours was appropriate, which resulted in an 18% PRM assumption in its 2020 IRP.

Market Support	PRM ICAP	PRM UCAP
Island	27%	23%
50 MW Cap 24Hrs	25%	20%
0-50 MW Cap Net Peak Hours	24%	20%
50 MW Cap Net Peak Hours	22%	18%
With 200-300 Market	14%	10%

Q. HOW DID PNM DETERMINE THAT THESE MARKET ASSUMPTIONS WERE APPROPRIATE?

A. As outlined by PNM Witness Phillips, a review of PNM's historical purchases including the summer of 2020 was analyzed. He also discusses the decline in market purchases that PNM has seen over the last few years. Based on PNM's experience in 2020, the 50 MW constraint during high net load peak hours is a reasonable amount of market assistance for planning purposes and the overall market assistance assumption lowers the required reserve margin by 5%. In other words, of the total required reserve margin of 23%, PNM is assuming 5% of its reserve margin will be met from day ahead and real time spot markets that do not have firm contracts ahead time. While PNM's interconnections are a benefit that can be utilized, it is not prudent to overly depend on day ahead or real time market purchases for resource adequacy needs. There is a high level of uncertainty on the amount of capacity that will be available in these markets during net load peak periods, especially when surrounding regions are experiencing similar weather

conditions. Resource adequacy risk to customers is lowered by PNM relying on resources contracted ahead of time to ensure the required reserve margin is met rather than relying too heavily on spot markets that may or may not have additional capacity during peak periods.

III. RELIABILITY OF REPLACEMENT RESOURCES

Q. MOVING TO THE PALO VERDE REPLACEMENT RESOURCES IN 2023, PLEASE DESCRIBE THE FINDINGS OF THE REPLACEMENT PORTFOLIOS.

A. As Witness Phillips discusses, PNM determined the following resources to fill the resource adequacy requirement in 2023:

- 100 MW of standalone battery (two-hour)
- Two hybrid resources with configurations as follows:
  - 40 MW Battery (four-hour) / 150 MW Solar PV
  - 150 MW Battery (four-hour) / 300 MW Solar PV

Q. WHAT WAS YOUR ROLE IN ASSESSING THE PALO VERDE REPLACEMENTS PORTFOLIOS?

A. Similar to the 2020 IRP, my team evaluated the reliability of the portfolios to ensure the resource adequacy standard was met in 2023. This was accomplished by taking the resources from PNM's EnCompass modeling in 2023 and capturing them in SERVM and assessing whether the LOLE standard of 0.2 days per year was maintained.

Q. FROM AN EXTERNAL MARKET PERSPECTIVE, WHAT WAS ASSUMED IN THE PALO VERDE REPLACEMENT RELIABILITY ANALYSIS?

A. The 2023 Palo Verde replacement portfolio was modeled with a 200-300 MW import constraint in all hours in which hourly load was greater than or equal to 85% of the annual gross peak load. In addition, it was modeled with a 100-150 MW import constraint during hours 16-18 from June to August when hourly load was greater than or equal to 85% of the annual gross peak load. Lastly a 50 MW import constraint was applied during hours 19-22 from June – August when the hourly load was greater than or equal to 80%[2] of the annual gross peak load. By modeling it in this way, the additional constraint is applied on peak days when it is expected PNM and its neighbors are experiencing high loads. On days with lower loads, no constraint is applied outside of the modeled neighbors' supply and demand balance captured in the simulations and the respective transmission path ratings between PNM and each neighboring entity.

Q. PLEASE PROVIDE THE RELIABILITY RESULTS OF THOSE REPLACEMENT PORTFOLIOS.

A. PNM's proposed portfolio met the LOLE standard of 0.2 with an LOLE of 0.2. As expected and consistent with the IRP results, the results showed that the 18% UCAP

[2] In SERVM, the percentage of annual peak load is provided for each constrained period modeled. In order to ensure the constraint was applied on peak load days, the percentage of annual peak load had to be decreased from 85% to 80% for hours 19-22 because these hours have a gross load much less than peak daily load.

reserve margin targeted in EnCompass produced a reliable portfolio in 2023 assuming the 0.2 LOLE standard.

Q. PNM IS PROPOSING A REPLACEMENT PORTFOLIO IN THIS PROCEEDING THAT DOES NOT INCLUDE ANY NEW COMBUSTION RESOURCES. HOW DOES THIS DECISION IMPACT RELIABILITY FOR THE SYSTEM MOVING FORWARD?

A. Systems that rely on intermittent and energy limited resources can do so in a reliable manner. While the intermittency and energy limits around these resources can be accommodated through ELCC analysis, it should be recognized that these calculations are more complex than capturing the UCAP of a fully dispatchable resource. For instance, ELCC values are dependent on a technology's own penetration as well as the overall combined portfolio of the system. While not all permutations of renewable and storage penetrations can be analyzed, a reasonable number of scenarios can be constructed to provide the input needed to inform expansion planning models and ensure the system is reliable. PNM is expected to have 690 MW of storage on its system by end of 2023, a resource type with which PNM currently has no operational experience. As PNM's first storage resources are deployed, the operation of these resources should be monitored and considered in future resource adequacy studies. Based on RFP bid data, the storage resources in the resource adequacy modeling are captured with full flexibility (e.g. no restrictions of state of charge, cycles per day, or charging/discharging hours) and

low forced outage rates (2% or less). To the extent these capabilities are not met during critical peak periods, modeling inputs should be adjusted for future analysis. Given this rapid increase in storage, it would be ill advised to take additional risks in the future from a resource adequacy perspective, especially when the system is already being planned to 0.2 LOLE rather than 0.1 LOLE. Finally, it should be recognized that PNM is not the only entity transforming its system. Prudent assumptions should be made around the availability of external support to ensure PNM is not over relying on neighbors during net peak periods.

Q. BECAUSE ELCC VALUES DEPEND ON THE COMBINED PORTFOLIO OF THE SYSTEM, DOES THIS MEAN THAT THE ELCCS OF THE EXISTING SYSTEM AND NEW RESOURCES SHOULD BE RECALCULATED OVER TIME?

A. Yes. ELCC values change as load and renewable profiles change and as the penetration of intermittent and storage resources changes. As PNM's portfolio mix evolves through time, it will be necessary to update the ELCC values of intermittent and energy limited resources and incorporate these updated values in future resource plans.

Q. WAS ANALYSIS PERFORMED WHERE PALO VERDE WAS REPLACED WITH A TECHNOLOGY-NEUTRAL PORTFOLIO OF RESOURCES?

A. Yes. A scenario was assessed where the 40 MW 4-Hour storage project combined with 150 MW Solar PV hybrid was substituted with a 40 MW Aeroderivative CT. This portfolio was determined to meet the same PRM UCAP as the portfolio with the hybrid resource. The same reliability analysis was performed as I described previously, which resulted in a 0.22 LOLE. From a 2023 reliability perspective, these two resources (the described hybrid resource and the Aeroderivative CT) can be considered equivalent. Throughout time as the penetrations of battery and solar increase, this relationship would change and more battery or solar would be required to be equivalent to a 40 MW Aeroderivative CT. This changing relationship will increasingly impact the cost and size of future new resources that will be required to maintain system reliability.

IV. CONCLUSIONS

Q. PLEASE SUMMARIZE THE CONCLUSIONS AND RECOMMENDATIONS IN YOUR TESTIMONY.

A. I conclude that the preferred portfolio submitted by PNM is reliable from an LOLE perspective. As PNM continues its path towards decarbonization, resource adequacy should be a priority. PNM has enhanced its resource adequacy framework as part of the 2020 IRP by including LOLE analysis in parallel with ELCC analysis on intermittent and energy limited resources to determine a target planning reserve margin. Given recent resource adequacy events in surrounding regions, it is critical for PNM to continue to not over rely on day ahead and real

time markets to be available during peak net load periods. I therefore find the assumptions used in the resource adequacy framework are reasonable and should be applied in considering the new resource portfolio. I recommend that these assumptions as well as the LOLE and ELCC analysis continue to be updated in future IRPs and resource acquisition proceedings as the system undergoes changes.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes it does.

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